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NOTES ON GEOGRAPHIC DISTRIBUTION

DNA Barcoding reveals the first record of Villamizar's Worm Salamander, *Oedipina villamizariorum* Reyes-Puig et al., 2020 (Caudata, Plethodontidae), on the former island prison Gorgona in Colombia

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Abstract. We document the first record of *Oedipina villamizariorum* Reyes-Puig et al., 2020 in Colombia, from Gorgona National Natural Park located in Guapi Municipality, Cauca department. With this record, the number of *Oedipina* species reported in the country rises to three, and the known distribution of *O. villamizariorum* is extended approximately 220 km north of its only previously known locality in Ecuador. Our research highlights the importance of combining DNA barcoding and traditional morphology to identify cryptic species.

Key words. Distribution, herpetofauna diversity, molecular markers, Neotropics, Pacific region

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INTRODUCTION

DNA barcoding, combined with traditional morphology, is a powerful and low-cost tool that enhances the characterization of taxonomic diversity across various geographical scales (Hebert et al. 2003a; Kress and Erickson 2012). This approach facilitates rapid species identification by sequencing and comparing genetic marker fragments with previously sequenced specimens, enabling the discovery of new species or the expansion of known distributions (Suriya et al. 2020). It has revolutionized biodiversity studies, particularly for cryptic and elusive species that are challenging to identify using only morphological characters (Hebert et al. 2003b; Ratnasingham and Hebert 2013). The effectiveness of DNA barcoding for discriminating amphibian species has been well-established in numerous studies (e.g. Hawkins et al. 2007; Gehara et al. 2014; Estupiñán et al. 2016; Jaramillo et al. 2020; Franco-Mena et al. 2023), making it an invaluable resource for documenting amphibian diversity at any life stage and providing insights into previously unidentified and described species (Crawford et al. 2013; Guarnizo et al. 2015). Incorporating genetic markers like DNA barcoding have improved our understanding of geographic distribution and taxonomy, becoming essential in biodiversity management and conservation efforts (Hebert et al. 2003a; Ratnasingham and Hebert 2013).

The genus *Oedipina* Keferstein, 1868 belongs to the family Plethodontidae Gray, 1850 and stands out as a well-supported monophyletic group (Wake and Elias 1983; García-París and Wake 2000). This group exhibits a unique morphology among tropical Hemidactyliinae salamanders and is characterized by an elongated body resulting from a greater number of vertebrae, ranging from 18 to 23 (Wake 1966; Brame 1968). The genus is also characterized by its cryptic habits, which are fossorial and rarely observed, making these salamanders especially difficult to detect in the field (Wake 1966). *Oedipina* comprises 40 recognized species found throughout a wide geographic range, extending from Chiapas in Mexico through Central America the western and Magdalena Valleys of Colombia, and finally reaching south-central Ecuador on the Pacific

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coast (Frost 2024). These elusive amphibians exhibit a moderate altitudinal distribution, ranging from sea level to altitudes up to 1,200 m above sea level (m a.s.l.) in Costa Rica and up to 1,150 m a.s.l. in Colombia (Brame and Wake 1963; McCranie and Townsend 2011; Acosta-Galvis et al. 2020).

Within the genus, *Oedipina complex* Dunn, 1924 is one of the species with the broadest distribution range. Brame and Wake (1963) expanded the geographic range of *O. complex* from its original locality in central Panama to Gorgona Island and northwestern Ecuador. However, according to Reyes-Puig et al. (2020), the presence of *O. complex sensu stricto* in Ecuador is under discussion, and they argue that the nominal taxon may represent a complex of cryptic species with distributions in western Colombia and northwestern Ecuador. Specimens previously identified as *O. complex* in Ecuador belong to *O. villamizariorum* Reyes-Puig et al., 2020 (holotype QCAZA75501), and an unnamed species. Additionally, they described another species, O. *ecuatoriana* Reyes-Puig et al., 2020 (holotype BMNH 1901.3.29.115), which was unassigned to *O. complex* or *O. parvipes* Peters, 1879 species groups due to the morphological similarities with both species (Reyes-Puig et al. 2020). Currently, *O. villamizariorum* is distributed in the western foothills of the Andes at ca. 920 m a.s.l. in the province of Carchi, Ecuador, whereas *O. ecuatoriana* is only known from its type locality at Paramba, province of Imbabura, Ecuador (Reyes-Puig et al. 2020; Frost 2024).

In Colombia, only two species have been recorded, *Oedipina complex* and *O. parvipes*, according to several authors (Brame and Wake 1963; Brame 1968; Ruiz-Carranza et al. 1996; Acosta-Galvis 2000, 2023; Lynch and Suárez-Mayorga 2010; Acosta-Galvis et al. 2020; Reyes-Puig et al. 2020), but a striking record of *Oedipina* comes from Gorgona Island. Initially, Federico Medem was the first to record the presence of a female specimen deposited in Smithsonian Institution National Museum of Natural History (USNM); this specimen came from north of the penal colony on the island in 1961 (Field Number Medem 641, USNM 152557; Medem 1968). Subsequently, Brame and Wake (1963) reidentified this specimen as *O. complex*. Then, Acosta-Galvis et al. (2020) also reported four more specimens of *O. complex* from the island (IAvH-Am-7952-5). No further reports of *Oedipina* have been documented for Gorgona Island.

In this study, we used DNA barcoding and morphological characteristics to identify a specimen of *Oedipina* collected during the Pacific Scientific Expedition Bocas de Sanquianga (ECP2021-I) in Gorgona National Natural Park. We have expanded the known distribution of a species of *Oedipina* previously recorded in Ecuador (Reyes-Puig et al. 2020). Our investigation has not only improved our understanding of the distribution of the species in *Oedipina* genus but also has significant implications for its conservation status, particularly through the likely discovery of cryptic species. The results have raised the possibility that the *O. complex* may contain additional cryptic species throughout its extensive range, an idea already proposed by Reyes-Puig et al. (2020).

METHODS

Study area. Gorgona Island is located approximately 35 km southwest of the Colombian Pacific coast. The island is 9 km long and 2.5 km wide and has an area of 26 km^2. Administratively, is part of the municipality of Guapi in the Department of Cauca. The island's landscape is characterized by rugged terrain, including notable features such as Cerro La Trinidad—the highest point on the island at 338 m a.s.l.—and prominent hills like Los Micos, La Esperanza, and El Mirador, which form the island's orographic backbone (Giraldo and Valencia 2012). The island has a volcanic origin and was previously part of the Caribbean Large Igneous Province. Following its formation, it integrated into the South American landmass during the Eocene period, approximately 90 million years ago (Serrano et al. 2011). Despite its current isolation, the island's proximity to the mainland is indicated by shallow depths of approximately 60–120 m, which may have formed a land bridge during the Last Glacial Maximum, around 21,000–17,000 years ago (Fleming et al. 1998).

Fieldwork and sampling. We conducted fieldwork in Parque Nacional Natural Isla Gorgona, Guapi, Valle del Cauca, Colombia, on 10–18 May 2021. This expedition was part of the second shift of the Pacific Scientific Expedition Bocas de Sanquianga (ECP2021-I), organized by the Comisión Colombiana del Océano (CCO), Dirección General Marítima (DIMAR), Parques Nacionales Naturales de Colombia (PNN), and the Universidad Nacional de Colombia (UN). This research is part of the project "Genetic Barcode and Taxonomic Richness of the Herpetofauna of the Sanquianga National Natural Park and Gorgona National Natural Park, Colombia" and was conducted under permit "PermisoDeMovilizacion120214600009772_00004," issued by the Subdirección de Gestión y Manejo de Áreas Protegidas, Parques Nacionales Naturales de Colombia.

Observation tracks were completed using the Visual Encounter Survey (VES) method, as described by Angulo et al. (2006) and Crump and Scott (1994). Our surveys aimed to cover each available habitat unit, considering the terrain's difficulty and accessibility. During the surveys, we examined microhabitats, including vegetation, water bodies, leaf litter, rocks, and logs. We conducted search activities during the day, dusk, and night, targeting peak amphibian activity hours 7:00–9:00 and 17:00–23:00. Our team invested a total of 240 hours of sampling effort, with two people dedicating eight hours each day. After capturing individuals, we followed the specialized literature (HACC 2004) to euthanize the specimens using a standardized

procedure with 5% lidocaine hydrochloride. We took tissue samples and swabs for molecular analyses and kept the tissues in 96% ethanol. Subsequently, we fixed the specimens in 10% formalin and stored them permanently in 70% ethanol. The specimens were deposited at the Instituto de Ciencias Naturales (ICN) of the Universidad Nacional (UN), while the tissue samples were deposited at the Banco de ADN y Tejidos de la Biodiversidad (UNAL:BTBC) at the Instituto de Genética (IGUN) of the UN, Bogotá D.C., Colombia.

Morphological analysis. We followed Highton (1957), Brame and Wake (1963), Brame and Wake (1972), Wilson and Larsen (1999), Wake et al. (2007), Sunyer et al. (2008, 2010), Rovito et al. (2012), and Brcko et al. (2013) for morphological characterization. The sex was determined based on the cloaca internal structures that is commonly used in plethodontids, where the internal cloaca walls in females contains folds and smooth in males (González-León and Ramírez-Pinilla 2011). Measurements were made in millimeters (mm, hereafter) using photos of the specimen with a scale in the software ImageJ as follows: snout to posterior end of cloaca (SL; small, ca. 40 mm; moderate, ca. 50–60 mm; large, ca. 70 mm; intermediate conditions are recognized in Brame and Wake 1963); snout to anterior point of vent (SVL); head length (HL) between tip of snout and posterior margin of mouth; head width (HW) at widest point, head depth (HD) at posterior angle of jaw; snout to gular fold (SGF); eyelid width (EYW); eyelid length (EYL); snout length (SNL), width of snout at widest point (LWS); width of snout at narrowest point (SWS); distance between external nares (EN); horizontal diameter orbit (OD); distance between anterior corners eyes (DBE); interorbital distance (IDE); length between nuchal groove and gular fold (NGGF); snout to axilla (SA); axilla to groin (AG); pectoral width (PECW); hand width (HDW); foot width (FW); length third finger (LIIIF); length third toe (LIIIT); length fifth toe (LVT); tail length (TL); tail width at base (TW); tail depth at base (TD); length from elbow to the tip of Finger III (FoAL); length from groin to knee (SaL); length from knee to tip of Toe III (LF); length from axil to elbow (AL); length from the nares opening to the tip of nasolabial protuberance (DNSL); weight (WGT).

Genomic extraction. To support the identification of our specimen, we performed a phylogenetic characterization based on the 16S ribosomal RNA (*16S*) and cytochrome b (*Cytb*) mitochondrial genes. We extracted total genomic DNA from a fresh tissue sample preserved in 96% ethanol using the NucleoSpin Tissue Mini kit for DNA from cells and tissue (MACHEREY-NAGEL). Gene fragments were amplified using the primer pairs 16SB-H/16SA-L (Palumbi et al. 2002) for *16S* and L14816/H15173 (Parson et al. 2000) for *Cytb*. The PCR was carried out in a total volume of 30 µl, consisting of approximately 2 µl of DNA, 1× buffer (with 2.0 mM of MgCl2), 0.6 mM of deoxyribonucleotide triphosphates (dNTPs), 1.5 µM of each primer, and 0.2 U/µl of Taq DNA Polymerase (Thermo Scientific, Waltham, MA, USA). The program included an initial denaturation step at 95 °C for 5 min, followed by 35 cycles of denaturation at 95 °C for 30 s, annealing at 54 °C for *16S* and 47 °C for *Cytb* for 30 s, and extension at 72 °C for 90 s, with a final extension step at 72 °C for 10 min. Sequencing was conducted with the amplification primer on an ABI 3500 sequencer (Applied Biosystems, Waltham, MA, USA). Extraction, amplification, and sequencing were performed at the Laboratorio de Ecología Molecular de Vertebrados Acuáticos (LEMVA) at the Universidad de los Andes (Uniandes) in Bogotá, Colombia.

Phylogenetic analysis. We analyzed the sequences of our specimen in a phylogenetic framework to assess its affinities with other *Oedipina* species. For this purpose, we downloaded sequences of *Oedipina* from Costa Rica, Ecuador, Guatemala, Honduras, Nicaragua, and Panama from GenBank, resulting in a final dataset of 65 sequences of 533 bp for *16S* and 72 sequences of 385 bp for *Cytb* (Table 1).

We performed sequence alignments using the Clustal W 1.4 algorithm in BioEdit v. 7.2.6 software (Hall 1999). Additionally, we created a concatenated alignment of *16S* and *Cytb*, composed of sequences from both genes obtained from the same individuals using the same alignment algorithm. This concatenated alignment consisted of 50 sequences, each 918 bp long. We inferred phylogenetic trees for the *16S*, *Cytb*, and the concatenated alignments using the maximum-likelihood approach implemented in IQ-TREE (Nguyen et al. 2015) with the following parameters: a perturbation strength of 0.5, an IQ-TREE stopping rule of 100, and 10,000 iterations for termination. The branch support was estimated from 10,000 pseudoreplicates using the ultrafast Bootstrap approach (Hoang et al. 2018), with values of 95% or higher considered to indicate strong support. For the *Cytb* analysis, we defined separate partitions by codon position. In the concatenated analysis, we used two partitions, one corresponding to *16S* and one to *Cytb*. In all cases, the substitution model TIM2+F+I+G4, selected based on the Bayesian Information Criterion (BIC), was applied for phylogenetic inference. We included samples of *Bolitoglossa* Duméril et al., 1854, and *Pseudoeurycea* Taylor, 1944, as outgroups to root the tree (based on Rovito et al. 2015; Table 1). We estimated uncorrected genetic *p*-distances (i.e. the proportion of nucleotide sites at which any two sequences differ) for the molecular markers *16S* and *Cytb* between our specimen and the most closely related *Oedipina* species, with 1,000 bootstrap replicates using the software MEGA v. 7.0 (Kumar et al. 2016).

RESULTS

We herein present the geographic extension of *Oedipina villamizariorum*, a species previously known only from its type locality in the western foothills of Carchi Province, Ecuador. Our new record extends its distri-

Table 1. GenBank accession numbers of *Bolitoglossa*, *Pseudoeurycea*, and *Oedipina* terminals used in the phylogenetic analyses. Institutional acronyms follow Sabaj (2020, 2025). Some vouchers are recorded with field codes: Andrew J. Crawford's (AJC), and Josiah Townsend's (JHT)

Voucher code	Species	Accession numbers		Source
		***16S* rRNA**	***Cytb***	
IIAP AR001121	*Bolitoglossa peruviana*	MG944407	MG944416	Cusi et al. 2020
MVZ:Herp:269550	*Pseudoeurycea goebeli*	MK165221	MK165228	Ellison et al. 2019
MVZ:Herp:190856	*Oedipina alleni*	—	AF199150	García-París and Wake 2000
MVZ:Herp:190857	*O. alleni*	AF199207	AF199149	García-París and Wake 2000
MVZ:Herp:225903	*O. alleni*	AF199208	AF199151	García-París and Wake 2000
Pichi464	*O. alleni*	MN520727	—	García-Rodríguez et al. 2021
Pichi465	*O. alleni*	MN520701	—	García-Rodríguez et al. 2021
UCR22845	*O. berlini*	KX792143	KX792144	Kubicki 2016
No voucher	*O. carablanca*	FJ196862	FJ196869	McCranie et al. 2008
CM158386	*O. capitalina*	KU495731	—	Solis et al. 2016
SIUC8896	*O. collaris*	FJ196863	FJ196870	McCranie et al. 2008
MVZ:Herp:236255	*O. complex*	AF199213	AF199157	García-París and Wake 2000
MVZ:Herp:128660	*O. complex*	AF199212	AF199156	García-París and Wake 2000
MVZ:Herp:138916	*O. cyclocauda*	AF199214	AF199158	García-París and Wake 2000
MVZ:Herp:203747	*O. cyclocauda*	AF199215	AF199159	García-París and Wake 2000
UTAA-56809	*O. elongata*	JN190932	—	Sunyer et al. 2011
JHT1821	*O. elongata*	—	JN190938	Sunyer et al. 2011
UTAA-51906	*O. elongata*	AF199216	AF199160	García-París and Wake 2000
UF176100	*O. gephyra*	JN190930	JN190936	Sunyer et al. 2011
UF176101	*O. gephyra*	JN190931	JN190937	Sunyer et al. 2011
USNM530582	*O. gephyra*	AF199218	AF199162	García-París and Wake 2000
USNM343462	*O. gephyra*	AF199217	AF199161	García-París and Wake 2000
MVZ:Herp:203753	*O. gracilis*	—	AF199163	García-París and Wake 2000
MVZ:Herp:210398	*O. gracilis*	AF199219	—	García-París and Wake 2000
MVZ:Herp:219593	*O. grandis*	—	AF199165	García-París and Wake 2000
MVZ:Herp:225904	*O. grandis*	AF199220	AF199164	García-París and Wake 2000
USNM530586	*O. ignea*	AF199231	AF199192	García-París and Wake 2000
USNM565898	*O. kasios*	JF499891	—	McCranie et al. 2011
USNM565899	*O. kasios*	JF499892	—	McCranie et al. 2011
UF156500	*O. kasios*	HM113477	HM113484	Sunyer et al. 2010
MVZ:Herp:232825	*O. kasios*	FJ196866	FJ196872	McCranie et al. 2008
MVZ:Herp:232826	*O. kasios*	FJ196867	FJ196873	McCranie et al. 2008
SMF90079	*O. koehleri*	JN190927	JN190934	Sunyer et al. 2011
UF156456	*O. koehleri*	JN190926	JN190933	Sunyer et al. 2011
MVZ:Herp:263988	*O. leptopoda*	MT524660	MT524702	Decena-Segarra et al. 2020
MVZ:Herp:167772	*O. leptopoda*	—	AF199193	García-París and Wake 2000
MVZ:Herp:219997	*O. maritima*	AF199221	AF199166	García-París and Wake 2000
CM158768	*O. nica*	KX686567	—	Hofmann et al. 2016
MHUL003	*O. nica*	JN190928	—	Sunyer et al. 2011
MVZ:Herp:263774	*O. nica*	JN560073	JN560005	Rovito et al. 2012
UF156445	*O. nica*	HM113470	HM113478	Sunyer et al. 2010
UF156446	*O. nica*	HM113473	HM113481	Sunyer et al. 2010
UF156447	*O. nica*	HM113474	HM113482	Sunyer et al. 2010
UF156451	*O. nica*	HM113471	HM113479	Sunyer et al. 2010
UF156452	*O. nica*	HM113472	HM113480	Sunyer et al. 2010
UF156453	*O. nica*	HM113475	HM113483	Sunyer et al. 2010
UF156454	*O. nica*	HM113476	—	Sunyer et al. 2010
MVZ:Herp:190858	*O. pacificensis*	—	AF199168	García-París and Wake 2000
MVZ:Herp:190859	*O. pacificensis*	—	AF199167	García-París and Wake 2000
UCR12063	*O. pacificensis*	AF199222	AF199169	García-París and Wake 2000
UCRE7	*O. pacificensis*	—	AF199170	García-París and Wake 2000
AJC1786	*O. parvipes*	FJ784316	—	Crawford et al. 2010
MVZ:Herp:210404	*O. parvipes*	AF199210	AF199154	García-París and Wake 2000

Voucher code	Species	Accession numbers		Source
		16S rRNA	*Cytb*	
MVZ:Herp:210405	*O. parvipes*	AF199211	AF199155	García-París and Wake 2000
MVZ:Herp:163703	*O. poelzi*	AF199224	AF199174	García-París and Wake 2000
MVZ:Herp:194873	*O. poelzi*	AF199226	AF199176	García-París and Wake 2000
MVZ:Herp:206398	*O. poelzi*	AF199223	AF199171	García-París and Wake 2000
MVZ:Herp:207128	*O. poelzi*	AF199225	AF199175	García-París and Wake 2000
MVZ:Herp:181235	*O. poelzi*	—	AF199172	García-París and Wake 2000
MVZ:Herp:181348	*O. poelzi*	—	AF199173	García-París and Wake 2000
MVZ:Herp:181229	*O. pseudouniformis*	—	AF199179	García-París and Wake 2000
MVZ:Herp:190852	*O. pseudouniformis*	—	AF199177	García-París and Wake 2000
MVZ:Herp:203749	*O. pseudouniformis*	AF199227	AF199178	García-París and Wake 2000
USNM565902	*O. quadra*	JF499895	—	McCranie et al. 2011
USNM565904	*O. quadra*	JF499896	—	McCranie et al. 2011
USNM565903	*O. quadra*	JF499894	—	McCranie et al. 2011
USNM565900	*O. quadra*	JF499893	—	McCranie et al. 2011
MVZ:Herp:232824	*O. quadra*	FJ196865	FJ196871	McCranie et al. 2008
JES2438	*O. salvadorensis*	—	MT524703	Decena-Segarra et al. 2020
MVZ:Herp:229360	*O. savagei*	—	AF199153	García-París and Wake 2000
UCR-LDG-961327	*O. savagei*	AF199209	AF199152	García-París and Wake 2000
SMF78738	*O.* sp.	FJ196868	—	McCranie et al. 2008
MVZ:Herp:138918	*O. stenopodia*	—	AF199180	García-París and Wake 2000
MVZ:Herp:163649	*O. stenopodia*	AF199228	AF199181	García-París and Wake 2000
MVZ:Herp:267200	*O. taylori*	KP886887	KP900080	Rovito et al. 2015
USAC:1134	*O. taylori*	HM068304	HM068302	Sunyer et al. 2010
MVZ:Herp:258037	*O. tomasi*	HM068305	KP900079	Rovito et al. 2015
UF 150066	*O. tomasi*	JN190929	JN190935	Sunyer et al. 2011
MVZ:Herp:190853	*O. uniformis*	AF199229	AF199185	García-París and Wake 2000
MVZ:Herp:203751	*O. uniformis*	AF199230	AF199190	García-París and Wake 2000
MVZ:Herp:181349	*O. uniformis*	—	AF199191	García-París and Wake 2000
MVZ:Herp:194862	*O. uniformis*	—	AF199186	García-París and Wake 2000
MVZ:Herp:194864	*O. uniformis*	—	AF199187	García-París and Wake 2000
MVZ:Herp:194871	*O. uniformis*	—	AF199184	García-París and Wake 2000
MVZ:Herp:221321	*O. uniformis*	—	AF199189	García-París and Wake 2000
MVZ:Herp:221340	*O. uniformis*	—	AF199182	García-París and Wake 2000
MVZ:Herp:225905	*O. uniformis*	—	AF199183	García-París and Wake 2000
MVZ:Herp:225906	*O. uniformis*	—	AF199188	García-París and Wake 2000
QCAZA75501	*O. villamizariorum*	MT328210	MT329630	Reyes-Puig et al. 2020
ICN 61531	*O. villamizariorum*	PP868428	PP874909	This study

bution range by approximately 220 km north from its type locality and 35 km from the nearest continental landmass across the Pacific Ocean (Figures 1, 2). As evidence for the new record, we present below the information associated with a vouchered specimen in herpetological scientific collection, from which we obtained the morphological and genetic characteristics, as well as comments on coloration patterns based on an in situ photograph (Figure 3).

Oedipina villamizariorum Reyes-Puig, Wake, Kotharambath, Streicher, Koch, Cisneros-Heredia, Yánez-Muñoz & Ron, 2020

New record. COLOMBIA — Department of Cauca • Guapi municipality, Gorgona National Natural Park, near the penitentiary ruins and laboratory facilities; 02.9654, –078.1738; ca. 20 m a.s.l; 14.V.2021; A. Acosta-Peña & E. Betancourt leg.; 1 ♂ specimen, vouchered as ICN 61531 and UNAL:BTBC:10441 for the tissue sample; GenBank accession number PP868428 for *16S* and PP874909 for *Cytb*.

The vouchered specimen was found by the VES method inside a rotting log at the edge of a secondary forest; the microhabitat was characterized by having an abundance of organic matter, such as leaf litter, and a high humidity.

Identification. Our specimen (ICN 61531, field number EB692) has the following characteristic (measurements in mm, except weight, in grams): SVL: 47.9; SL: 47.4; TL: 80; SaL: 5.12; LF: 3.72; FoAL: 4.08; AL: 3.35; SGF: 8.46; HW: 5.41; SA: 13.48; AG: 33.92; LWS: 3.82; SWS: 2.80; EN: 1.52; DBE: 1.67; EYL: 1.88; EYW: 1.09; IDE: 1.80; HL:

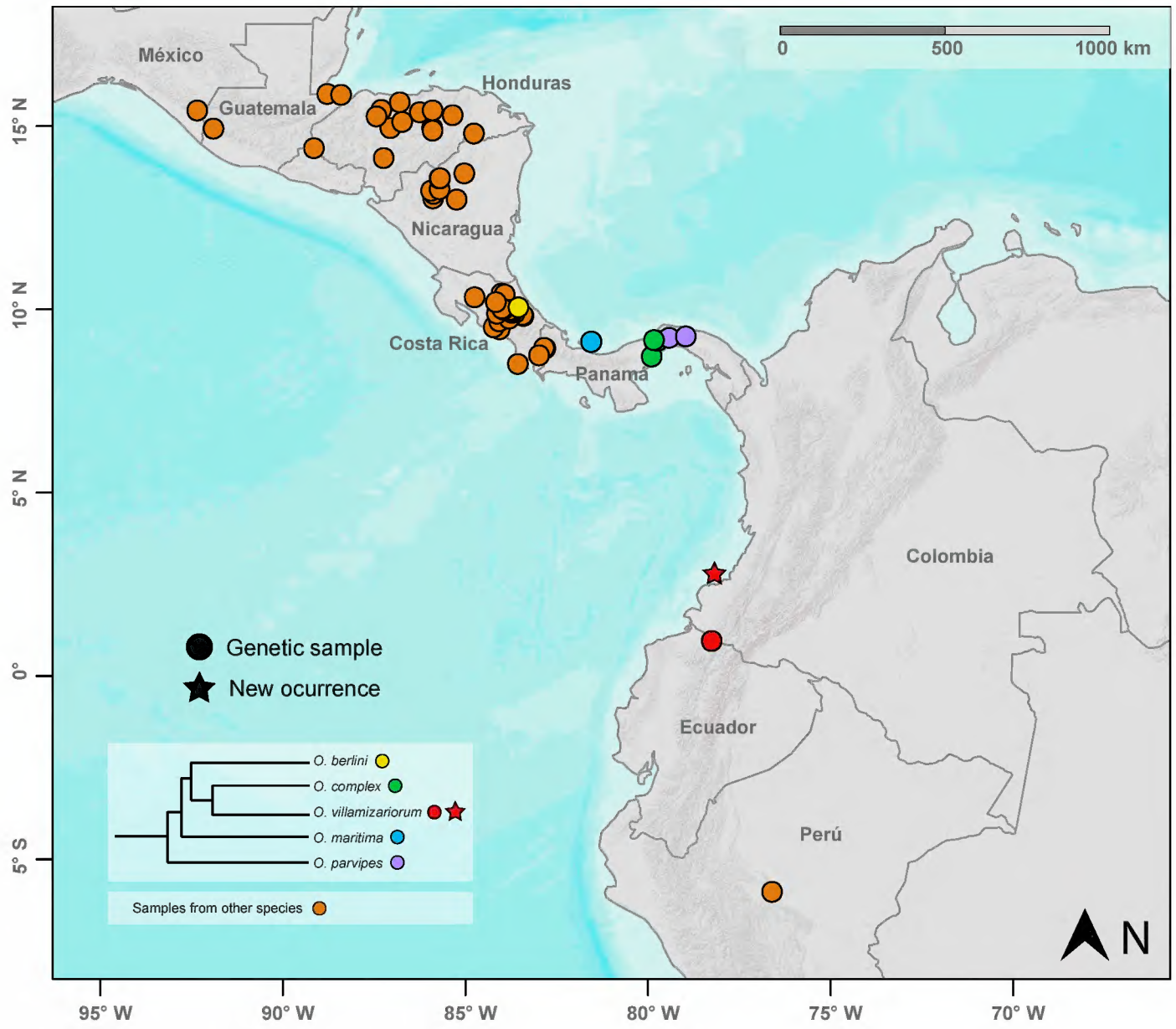

Figure 1. Map showing the georeferenced genetic samples of *Oedipina*, *Bolitoglossa* and *Pseudoeurycea* species used in the phylogenetic analyses. Catalog numbers and locality information of the mapped samples are listed in Table A1.

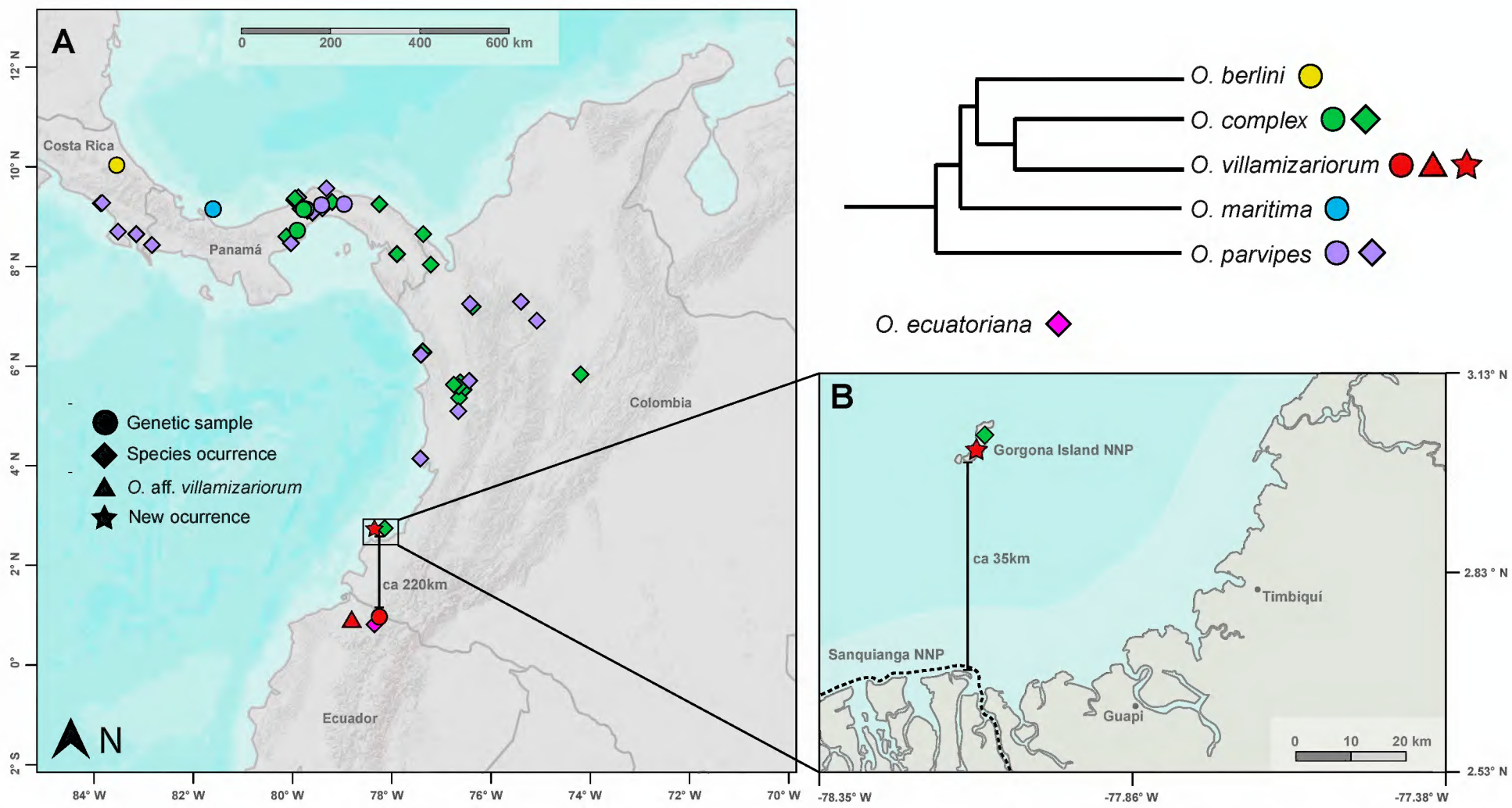

Figure 2. **A.** Map of the records available of species closely related to *Oedipina villamizariorum* showing that its geographic distribution extends ca. 220 km to the north, and ca. 36km apart from continental land. **B.** A record of *O.* aff. *villamizariorum* from Playa de Oro, Esmeraldas province is also included (FHGO 9642; Reyes-Puig et al. 2020). Map showing the approximate distance of Gorgona Island NNP with the continent. Catalog numbers and locality information of the mapped samples are listed in Table A1. Abbreviations: NNP, National Natural Park.

Figure 3. Adult individual of *Oedipina villamizariorum* from Gorgona Island, Colombia (Photograph by Darío Alarcón-Naforo).

6.75; OD: 1.25; HD: 3.78; SNL: 1.81; DNSL: 1.06; NGGF: 3.31; TW: 3.40; TD: 3.64; PECW: 5.52; HDW: 1.48; LIIIF: 1.41; FW: 1.70; LIIIT: 1.42; LVT: 0.80; WGT: 1.7). It has 17 costal grooves and 16 limb intervals. The body is predominantly dark brown, densely covered with light blue spots. In contrast, the head is light brown and features a cream-colored facial mask that extends across the frontal, parietal, and occipital regions (Figure 3). The dorsal surfaces of the limbs exhibit scattered cream markings.

Oedipina villamizariorum is distinguished from *O. complex sensu stricto* by subtle morphological traits: it has a more elongated and pointed head with a truncated snout, while the snout of *O. complex* is short and rounded to pointed (Carrión 2020). Additionally, the fingers of *O. villamizariorum* are characterized by being pointed and moderately long, in contrast to the truncated and short fingers of *O. complex* (Carrión 2020; Reyes-Puig et al. 2020).

The maximum-likelihood phylogenetic tree of the concatenated alignment (lnL = –7580.573) of the *16S* and *Cytb* genes (Figure 4), along with the separate phylogenies of the *16S* (Figure A1) and *Cytb* (Figure A2) genes, confirmed that ICN 61531 is sister to the sequence of the holotype of *O. villamizariorum* (QCAZA75501) reported for Ecuador (UF Bootstrap = 100). Phylogenetic analyses placed *O. villamizariorum* within the *O. complex* species complex, forming a sister species clade with *O. belini* Kubicki, 2016, thus confirming the phylogenetic relationship hypothesis proposed by Reyes-Puig et al. (2020).

The genetic distance between ICN 61531 and other available specimens of *Oedipina villamizariorum* is 0.64% for *16S* and 2.86% for *Cytb* (*p*-distance). The distances between ICN 61531 and the remaining *Oedipina* species range from 2.65% (with *O. complex*) to 9.8% (with *O. nica* Sunyer et al., 2010; Table A2) for *16S*, and from 6.45% (with *O. complex*) to 19.35% (with *O. grandis* Brame & Duellman, 1970; and *O. collaris* Stejneger, 1907; Table A3) for *Cytb*. The genetic distances between *O. villamizariorum* and *O. parvipes*, the other species found in Colombia, are 3.96% for *16S* and 6.45% for *Cytb*.

DISCUSSION

Our record confirms the presence of *Oedipina villamizariorum* in Colombia and increases the richness of the genus in the country to three species (Acosta-Galvis 2023; Frost 2024). There are no other known published records between Ecuador and Colombia, resulting in a significant spatial gap in the potential distribution of the species in the Pacific region. Our study has provided the first specific sequences of the genus for Colombia. However, additional sampling is necessary to conduct more comprehensive analyses that will better assess the true diversity of this genus in Colombia and the phylogenetic relationships among populations. The relationships presented in this study should not be interpreted as the definitive phylogenetic relationships among the species, as they are based solely on the signal from two mitochondrial genes and include nodes with low support that fail to resolve certain relationships (Figure 4). To achieve stronger support and to potentially reveal alternative evolutionary patterns among species, a more comprehensive assessment would require additional data, particularly from nuclear genes

Some specimens previously identified as the *O. complex* in biological collections may instead be *O. villamizariorum* due to similarities in their external morphology. Internal characteristics may provide greater resolution, complicating their diagnosis in the field and limiting external taxonomic reviews due to the low number of specimens in biological collections.

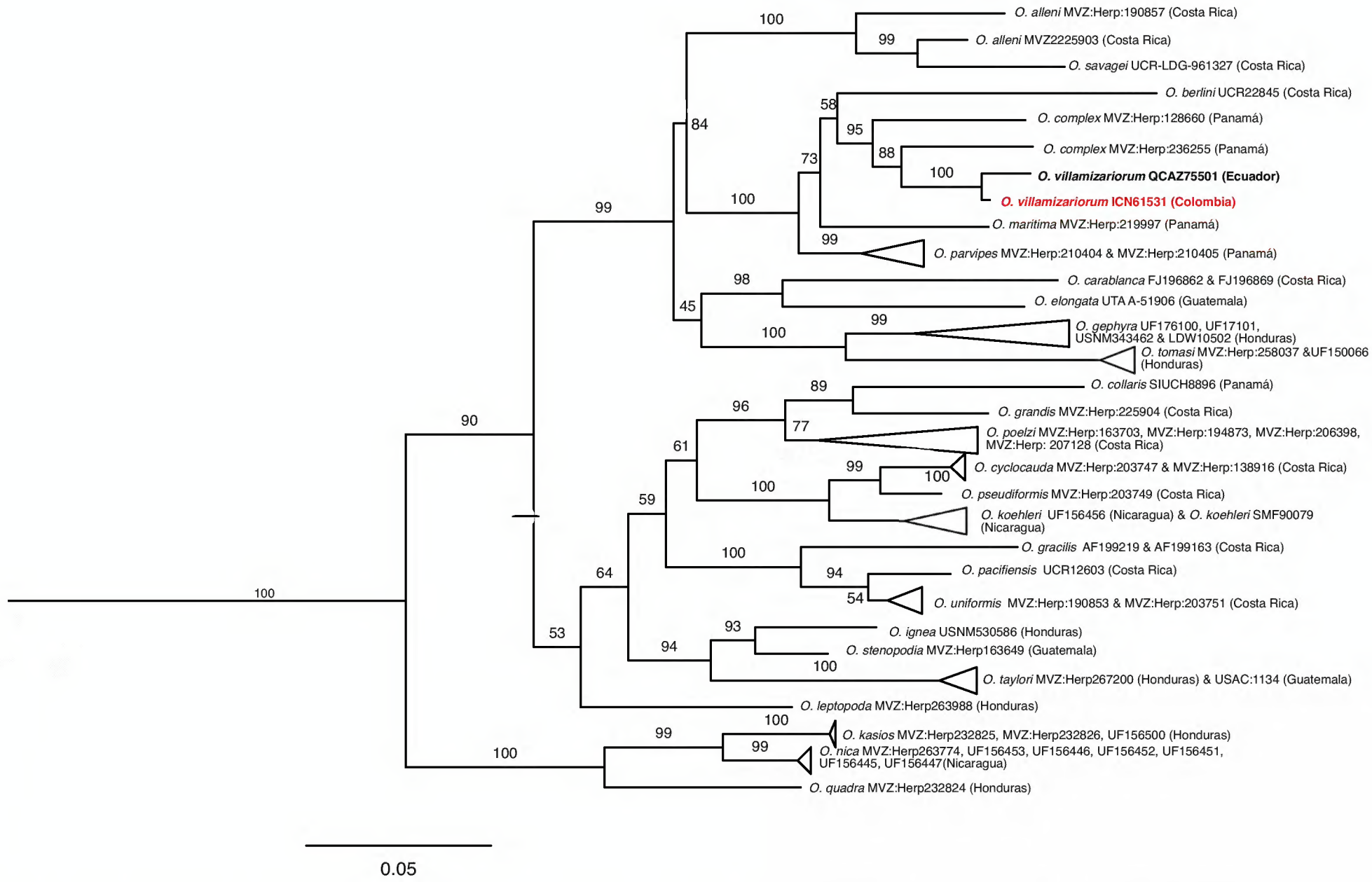
O. alleni MVZ:Herp:190857 (Costa Rica)
O. alleni MVZ2225903 (Costa Rica)
O. savagei UCR-LDG-961327 (Costa Rica)
O. berlini UCR22845 (Costa Rica)
O. complex MVZ:Herp:128660 (Panamá)
O. complex MVZ:Herp:236255 (Panamá)
O. villamizariorum QCAZ75501 (Ecuador)
O. villamizariorum ICN61531 (Colombia)
O. maritima MVZ:Herp:219997 (Panamá)
O. parvipes MVZ:Herp:210404 & MVZ:Herp:210405 (Panamá)
O. carablanca FJ196862 & FJ196869 (Costa Rica)
O. elongata UTA A-51906 (Guatemala)
O. gephyra UF176100, UF17101, USNM343462 & LDW10502 (Honduras)
O. tomasi MVZ:Herp:258037 &UF150066 (Honduras)
O. collaris SIUCH8896 (Panamá)
O. grandis MVZ:Herp:225904 (Costa Rica)
O. poelzi MVZ:Herp:163703, MVZ:Herp:194873, MVZ:Herp:206398, MVZ:Herp: 207128 (Costa Rica)
O. cyclocauda MVZ:Herp:203747 & MVZ:Herp:138916 (Costa Rica)
O. pseudiformis MVZ:Herp:203749 (Costa Rica)
O. koehleri UF156456 (Nicaragua) & O. koehleri SMF90079 (Nicaragua)
O. gracilis AF199219 & AF199163 (Costa Rica)
O. pacifiensis UCR12603 (Costa Rica)
O. uniformis MVZ:Herp:190853 & MVZ:Herp:203751 (Costa Rica)
O. ignea USNM530586 (Honduras)
O. stenopodia MVZ:Herp163649 (Guatemala)
O. taylori MVZ:Herp267200 (Honduras) & USAC:1134 (Guatemala)
O. leptopoda MVZ:Herp263988 (Honduras)
O. kasios MVZ:Herp232825, MVZ:Herp232826, UF156500 (Honduras)
O. nica MVZ:Herp263774, UF156453, UF156446, UF156452, UF156451, UF156445, UF156447(Nicaragua)
O. quadra MVZ:Herp232824 (Honduras)
0.05

Figure 4. Phylogenetic tree of concatenated *16S* and *Cytb* genes (log-likelihood score: –7580.573) estimated by the maximum-likelihood optimization method, showing the relationship of the newly specimen ICN 61531 from Colombia (in red) within the holotype terminal of *Oedipina villamizariorum* from Ecuador (in bold). Numbers above clades indicate the UF Bootstrap support of each clade.

For the same geographical area, Vigle et al. (2020) estimated a divergence of approximately 3 Ma between two sister frog species: *Leucostethus bilsa* Vigle et al., 2020 from northeastern Ecuador and *L. siapida* Grant & Bolívar-García, 2021 from Gorgona Island, despite the recent isolation of Gorgona Island from the mainland (approximately 21–17 thousand years ago; Fleming et al. 1998). Grant and Bolívar-García (2021) suggested that the presence of *L. siapida* on Gorgona Island is not a result of speciation between these two species; rather, it likely stems from events that occurred before the island's recent isolation, as the island population may be a potential relict from an unknown continental population. Considering the similarities in the distribution of *O. villamizariorum* and *O. complex*, the cryptic behavior of *O. villamizariorum*, the subsampling in the Pacific region, and the small genetic distance between the Ecuadorian and Gorgona samples, there is a possibility of new records on the continent.

Reyes-Puig et al. (2020) proposed that the Ecuadorian populations are Critically Endangered according to the International Union for Conservation of Nature (IUCN) criterion B1ab (i, iii) due to a reduced distribution range of less than 100 km^2. This recommendation was supported by its inclusion in the evaluation of the Red List of Amphibian Species of Ecuador, where it was also listed as Critically Endangered under the same criterion (Ortega-Andrade et al. 2021). Expanding the species' range to Gorgona National Natural Park represents an important conservation contribution. Nevertheless, the record remains limited to a single population isolated from the mainland and confined to only 26 km^2. This report underscores the need for further field surveys and research, particularly in areas where the species' presence remains unconfirmed. Robust information on population size, distribution, and connectivity will be essential to support any future reassessment of its conservation category. Beyond confirming the presence of this salamander species in the country, many key aspects of its biology and ecology remain poorly understood. Several fundamental aspects of its morphology, population genetics, and ecological behavior require additional analysis, including detailed studies of its distribution, small-scale population abundance, morphological variation, and population structure. These additional studies will be critical in providing decision-makers with the information needed to manage and conserve this species effectively. In short, the presence of this enigmatic salamander adds another important factor to consider Gorgona Island as a vital enclave for biodiversity conservation.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

The guidelines specified in the Guidelines for Use of Live Amphibians and Reptiles in Field and Laboratory Research from the Herpetological Animal Care and Use Committee of the American Society of Ichthyologists and Herpetologists (HACC 2004) were followed to euthanize the specimens, using a standardized procedure with 5% lidocaine hydrochloride. No additional ethical statements are reported.

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Author contributions

Conceptualization: EB, AMS-G, AA-P. Data curation: AMS-G, AA-P, EB. Formal analysis: AMS-G, EB. Funding acquisition: DP. Investigation: EB, AMS-G, AA-P. Methodology: EB, AMS-G. Resources: DP. Supervision: AMS-G, EB. Visualization: AMS-G, EB, AA-P, DA-N Project administration: EB, DP. Validation: AMS-G. Writing – original draft: EB, AMS-G. Writing – review and editing: AMS-G, EB, AA-P.

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Data availability

All data that support the findings of this study are available in the main text, Appendix, and GenBank under accession numbers PP868428 and PP874909.

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APPENDIX

The appendix includes a table summarizing the geographical information of the records used for the map elaboration (Table A1), the phylogenetic trees of *16S* and *Cytb* genes estimated by the Maximum-likelihood optimization method (Figures A1, A2), and tables including their corresponding *p*-distances (Tables A2, A3).

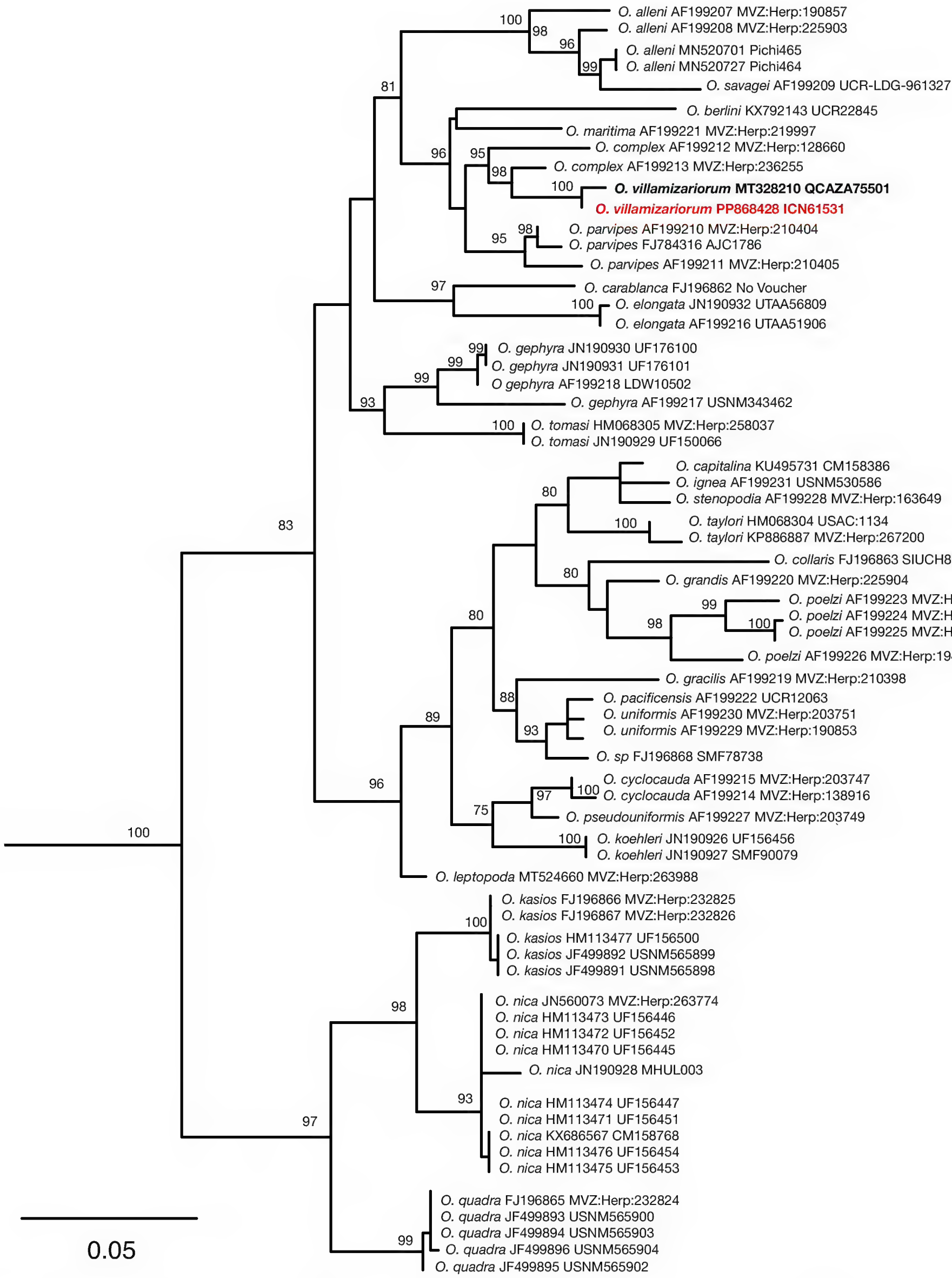
O. alleni AF199207 MVZ:Herp:190857
O. alleni AF199208 MVZ:Herp:225903
O. alleni MN520701 Pichi465
O. alleni MN520727 Pichi464
O. savagei AF199209 UCR-LDG-961327
O. berlini KX792143 UCR22845
O. maritima AF199221 MVZ:Herp:219997
O. complex AF199212 MVZ:Herp:128660
O. complex AF199213 MVZ:Herp:236255
O. villamizariorum MT328210 QCAZA75501
O. villamizariorum PP868428 ICN61531
O. parvipes AF199210 MVZ:Herp:210404
O. parvipes FJ784316 AJC1786
O. parvipes AF199211 MVZ:Herp:210405
O. carablanca FJ196862 No Voucher
O. elongata JN190932 UTAA56809
O. elongata AF199216 UTAA51906
O. gephyra JN190930 UF176100
O. gephyra JN190931 UF176101
O gephyra AF199218 LDW10502
O. gephyra AF199217 USNM343462
O. tomasi HM068305 MVZ:Herp:258037
O. tomasi JN190929 UF150066
O. capitalina KU495731 CM158386
O. ignea AF199231 USNM530586
O. stenopodia AF199228 MVZ:Herp:163649
O. taylori HM068304 USAC:1134
O. taylori KP886887 MVZ:Herp:267200
O. collaris FJ196863 SIUCH8896
O. grandis AF199220 MVZ:Herp:225904
O. poelzi AF199223 MVZ:Herp:206398
O. poelzi AF199224 MVZ:Herp:163703
O. poelzi AF199225 MVZ:Herp:207128
O. poelzi AF199226 MVZ:Herp:194873
O. gracilis AF199219 MVZ:Herp:210398
O. pacificensis AF199222 UCR12063
O. uniformis AF199230 MVZ:Herp:203751
O. uniformis AF199229 MVZ:Herp:190853
O. sp FJ196868 SMF78738
O. cyclocauda AF199215 MVZ:Herp:203747
O. cyclocauda AF199214 MVZ:Herp:138916
O. pseudouniformis AF199227 MVZ:Herp:203749
O. koehleri JN190926 UF156456
O. koehleri JN190927 SMF90079
O. leptopoda MT524660 MVZ:Herp:263988
O. kasios FJ196866 MVZ:Herp:232825
O. kasios FJ196867 MVZ:Herp:232826
O. kasios HM113477 UF156500
O. kasios JF499892 USNM565899
O. kasios JF499891 USNM565898
O. nica JN560073 MVZ:Herp:263774
O. nica HM113473 UF156446
O. nica HM113472 UF156452
O. nica HM113470 UF156445
O. nica JN190928 MHUL003
O. nica HM113474 UF156447
O. nica HM113471 UF156451
O. nica KX686567 CM158768
O. nica HM113476 UF156454
O. nica HM113475 UF156453
O. quadra FJ196865 MVZ:Herp:232824
O. quadra JF499893 USNM565900
O. quadra JF499894 USNM565903
O. quadra JF499896 USNM565904
O. quadra JF499895 USNM565902
0.05

Figure A1. Phylogenetic trees of *16S* gene estimated by the maximum-likelihood optimization method showing the relationship of the newly specimen ICN 61531 from Colombia (in red) within the holotype terminal of *Oedipina villamizariorum* from Ecuador (in bold). Numbers above clades indicate the UF Bootstrap support of each clade. Only supports >75 are shown.

O. alleni AF199151 MVZ:Herp:225903
O. savagei AF199153 MVZ:Herp:229360
O. savagei AF199152 UCR-LDG-961327
O. alleni AF199150 MVZ:Herp:190856
O. alleni AF199149 MVZ:Herp:190857
O. berlini KX792144 UCR22845
O. complex AF199157 MVZ:Herp:236255
O. complex AF199156 MVZ:Herp:128660
O. villamizariorum MT329630 QCAZA5501
O. villamizariorum PP874909 ICN61531
O. maritima AF199166 MVZ:Herp:219997
O. parvipes AF199155 MVZ:Herp:210405
O. parvipes AF199154 MVZ:Herp:210404
O. gephyra AF199162 LDW10502
O. gephyra JN190937 UF17101
O. gephyra JN190936 UF17100
O. gephyra AF199161 USNM343462
O. tomasi JN190935 UF150066
O. tomasi KP900079 MVZ:Herp:258037
O. carablanca FJ196869 No Voucher
O. elongata JN190938 JHT1821
O. elongata AF199160 UTAA-51906
O. collaris FJ196870 SIUCH8896
O. grandis AF199165 MVZ:Herp:219593
O. grandis AF199164 MVZ:Herp:225904
O. leptopoda MT524702 MVZ:Herp:263988
O. leptopoda AF199193 MVZ:Herp:167772
O. poelzi AF199175 MVZ:Herp:207128
O. poelzi AF199174 MVZ:Herp:163703
O. poelzi AF199173 MVZ:Herp:181348
O. poelzi AF199172 MVZ:Herp:181235
O. poelzi AF199171 MVZ:Herp:206398
O. poelzi AF199176 MVZ:Herp:194873
O. cyclocauda AF199158 MVZ:Herp:138916
O. cyclocauda AF199159 MVZ:Herp:203747
O. pseudouniformis AF199179 MVZ:Herp:181229
O. pseudouniformis AF199178 MVZ:Herp:203749
O. pseudouniformis AF199177 MVZ:Herp:190852
O. koehleri JN190934 SMF90079
O. koehleri JN190933 UF156456
O. gracilis AF199163 MVZ:Herp:203753
O. uniformis AF199183 MVZ:Herp:225905
O. uniformis AF199182 MVZ:Herp:221340
O. uniformis AF199188 MVZ:Herp:225906
O. uniformis AF199191 MVZ:Herp:181349
O. uniformis AF199189 MVZ:Herp:221321
O. uniformis AF199187 MVZ:Herp:194864
O. uniformis AF199186 MVZ:Herp:194862
O. uniformis AF199190 MVZ:Herp:203751
O. uniformis AF199185 MVZ:Herp:190853
O. uniformis AF199184 MVZ:Herp:194871
O. pacificensis AF199170 UCRE7
O. pacificensis AF199169 UCR12063
O. pacificensis AF199168 MVZ:Herp:190858
O. pacificensis AF199167 MVZ:Herp:190859
O. salvadorensis MT524703 JES2438
O. taylori HM068302 USAC:1134
O. taylori KP900080 MVZ:Herp:267200
O. ignea AF199192 USNM530586
O. stenopodia AF199181 MVZ:Herp:163649
O. stenopodia AF199180 MVZ:Herp:138918
O. kasios FJ196873 MVZ:Herp:232826
O. kasios FJ196872 MVZ:Herp:232825
O. kasios HM113484 UF156500
O. quadra FJ196871 MVZ:Herp:232824
O. nica HM113478 UF156445
O. nica HM113481 UF156446
O. nica HM113482 UF156447
O. nica HM113480 UF156452
O. nica HM113479 UF156451
O. nica JN560005 MVZ:Herp:263774
O. nica HM113483 UF156453
0.06

Figure A2. Phylogenetic trees of *Cytb* gene estimated by the maximum-likelihood optimization method showing the relationship of the newly specimen ICN 61531 from Colombia (in red) within the holotype terminal of *Oedipina villamizariorum* from Ecuador (in bold). Numbers above clades indicate the UF Bootstrap support of each clade. Only supports >75 are shown.

Table A1. Geographic information of the records used in the distributional maps (Figures 2, 3). Institutional acronyms follow Sabaj (2020, 2025). Some vouchers are recorded with field codes: Guido F. Medina's (GFM), Andrew J. Crawford's (AJC), and Josiah Townsend's (JHT).

Voucher	Genes	Species	Country	Province / department	Latitude	Longitude	Source
IIAP AR001121	*16S* rRNA, *Cytb*	*Bolitoglossa peruviana* Boulenger, 1883	Peru	Loreto	−5.884	−76.604	Cusi et al. 2020
MVZ:Herp:269550	*16S* rRNA, *Cytb*	*Pseudoeurycea goebeli* Schmidt, 1936	Mexico	Chiapas	15.428	−92.346	Ellison et al. 2019
MVZ:Herp:190856	Cytb	*Oedipina alleni* Taylor, 1954	Costa Rica	Puntarenas	8.515	−83.563	García-París and Wake 2000
MVZ:Herp:190857	*16S* rRNA, *Cytb*	*O. alleni* Taylor, 1954	Costa Rica	Puntarenas	8.515	−83.563	García-París and Wake 2000
MVZ:Herp:225903	*16S* rRNA, *Cytb*	*O. alleni* Taylor, 1954	Costa Rica	Puntarenas	9.514	−84.226	García-París and Wake 2000
Pichi464	*16S* rRNA	*O. alleni* Taylor, 1954	Costa Rica	Talamanca	9.677	−84.076	García-Rodríguez et al. 2021
Pichi465	*16S* rRNA	*O. alleni* Taylor, 1954	Costa Rica	Puntarenas	9.462	−84.063	García-Rodríguez et al. 2021
UCR22845	*16S* rRNA, *Cytb*	*O. berlini* Kubicki, 2016	Costa Rica	Limón	10.058	−83.549	Kubicki 2016
CM158386	*16S* rRNA	*O. capitalina* Solis et al., 2016	Honduras	Francisco Morazán	14.131	−87.241	Solis et al. 2016
No voucher	*16S* rRNA, *Cytb*	*O. carablanca* Brame, 1968	Costa Rica	Limón	—	—	McCranie et al. 2008
SIUC8896	*16S* rRNA, *Cytb*	*O. collaris* Stejneger, 1907	Panama	Coclé	—	—	McCranie et al. 2008
MVZ:Herp:184918	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.367	−79.950	GBIF 2023
No voucher	—	*O. complex* Dunn, 1924	Colombia	Chocó	8.038	−77.215	Urrutia and Rentería Moreno 2021
MCZ:Herp:A-10660	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10661	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10662	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10663	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10664	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-15818	—	*O. complex* Dunn, 1924	Panama	Comarca Guna Yala	9.250	−78.250	GBIF 2023
MCZ:Herp:A-19781	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-19782	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-33239	—	*O. complex* Dunn, 1924	Panama	Barro Colorado	9.164	−79.838	GBIF 2023
MCZ:Herp:A-92898	—	*O. complex* Dunn, 1924	Panama	Panamá	9.167	−79.400	GBIF 2023
MCZ:Herp:A-9408	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.117	−79.700	GBIF 2023
CAS:HERP:98255	—	*O. complex* Dunn, 1924	Panama	Cocle	8.601	−80.127	GBIF 2023
COLZOOCH-H: 0090	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.626	−76.749	GBIF 2023
COLZOOCH-H: 1234	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.360	−76.646	GBIF 2023
COLZOOCH-H: 2016	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.675	−76.621	GBIF 2023
COLZOOCH-H: 2398	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.527	−76.556	GBIF 2023
COLZOOCH-H: 2567	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.589	−76.650	GBIF 2023
COLZOOCH-H: 2568	—	*O. complex* Dunn, 1924	Colombia	Chocó	5.589	−76.650	GBIF 2023
EAFIT-Am 0110	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.263	−77.375	GBIF 2023
EAFIT-Am 0147	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.278	−77.376	GBIF 2023
EAFIT-Am 0149	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.263	−77.375	GBIF 2023
EAFIT-Am 0197	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.263	−77.375	GBIF 2023
EAFIT-Am 0231	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.296	−77.376	GBIF 2023
EAFIT-Am 0268	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.285	−77.359	GBIF 2023
EAFIT-Am 0269	—	*O. complex* Dunn, 1924	Colombia	Chocó	6.285	−77.359	GBIF 2023
GFM 1721	—	*O. complex* Dunn, 1924	Colombia	Antioquia	7.192	−76.371	Acosta-Galvis et al. 2020
GFM 508	—	*O. complex* Dunn, 1924	Colombia	Chocó	8.648	−77.368	Acosta-Galvis et al. 2020
IAvH-Am-16458	—	*O. complex* Dunn, 1924	Colombia	Boyaca	5.833	−74.196	Acosta-Galvis et al. 2020
IAvH-Am-7952	—	*O. complex* Dunn, 1924	Colombia	Cauca	2.965	−78.179	Acosta-Galvis et al. 2020
IAvH-Am-7953	—	*O. complex* Dunn, 1924	Colombia	Cauca	2.965	−78.179	Acosta-Galvis et al. 2020
IAvH-Am-7954	—	*O. complex* Dunn, 1924	Colombia	Cauca	2.965	−78.179	Acosta-Galvis et al. 2020
IAvH-Am-7955	—	*O. complex* Dunn, 1924	Colombia	Cauca	2.965	−78.179	Acosta-Galvis et al. 2020
MVZ:Herp:66193	—	*O. complex* Dunn, 1924	Panama	Barro Colorado	9.165	−79.837	GBIF 2023
UMMZ:Herp:63541	—	*O. complex* Dunn, 1924	Panama	Zona del Canal de Panamá	9.155	−79.845	GBIF 2023
UMMZ:herps:123675	—	*O. complex* Dunn, 1924	Panama	Darién	8.247	−77.896	GBIF 2023
YPM HERA 020155	—	*O. complex* Dunn, 1924	Panama	Panamá	9.293	−79.205	GBIF 2023
MVZ:Herp:236255*	*16S* rRNA, *Cytb*	*O. complex* Dunn, 1924	Panama	Panamá Oeste	8.717	−79.900	García-París and Wake 2000
MVZ:Herp:128660	*16S* rRNA, *Cytb*	*O. complex* Dunn, 1924	Panama	Colón	9.164	−79.838	García-París and Wake 2000
MVZ:Herp:138916	*16S* rRNA, *Cytb*	*O. cyclocauda* Taylor, 1952	Costa Rica	Heredia	10.433	−84.017	García-París and Wake 2000
MVZ:Herp:203747	*16S* rRNA, *Cytb*	*O. cyclocauda* Taylor, 1952	Costa Rica	Heredia	10.433	−84.017	García-París and Wake 2000
MVZ:Herp:203753	Cytb	*O. gracilis* Taylor, 1952	Costa Rica	Heredia	10.433	−84.017	García-París and Wake 2000
MVZ:Herp:210398	*16S* rRNA	*O. gracilis* Taylor, 1952	Costa Rica	Heredia	10.117	−83.917	García-París and Wake 2000
MVZ:Herp:219593	Cytb	*O. grandis* Brame & Duellman, 1970	Costa Rica	Puntarenas	8.937	−82.813	García-París and Wake 2000
MVZ:Herp:225904	*16S* rRNA, *Cytb*	*O. grandis* Brame & Duellman, 1970	Costa Rica	Puntarenas	8.954	−82.846	García-París and Wake 2000
NHMUK ZOO 1901.3.29.115	—	*O. ecuatoriana* Reyes-Puig et al., 2020	Ecuador	Imbabura	0.817	−78.350	Reyes-Puig et al. 2020
UTAA-56809	*16S* rRNA	*O. elongata* Schmidt, 1936	Honduras	Copán	15.879	−88.785	Sunyer et al. 2011
UTAA-51906	*16S* rRNA, *Cytb*	*O. elongata* Schmidt, 1936	Guatemala	Izabal	—	—	García-París and Wake 2000
JHT1821	Cytb	*O. elongata* Schmidt, 1936	Honduras	Cortés	—	—	Sunyer et al. 2011
UF176100	*16S* rRNA, *Cytb*	*O. gephyra* McCranie et al., 1993	Honduras	Yoró	15.445	−87.304	Sunyer et al. 2011
UF176101	*16S* rRNA, *Cytb*	*O. gephyra* McCranie et al., 1993	Honduras	Yoró	15.445	−87.304	Sunyer et al. 2011
USNM530582	*16S* rRNA, *Cytb*	*O. gephyra* McCranie et al., 1993	Honduras	No data	—	—	García-París and Wake 2000

Voucher	Genes	Species	Country	Province / department	Latitude	Longitude	Source
USNM343462	*16S* rRNA, *Cytb*	*O. gephyra* McCranie et al., 1993	Honduras	Atlántida	15.650	−86.800	García-París and Wake 2000
USNM530586	*16S* rRNA, *Cytb*	*O. ignea* Stuart, 1952	Honduras	Ocotepeque	14.400	−89.150	García-París and Wake 2000
USNM565898	*16S* rRNA	*O. kasios* McCranie et al., 2008	Honduras	Olancho	14.949	−85.913	McCranie et al. 2011
USNM565899	*16S* rRNA	*O. kasios* McCranie et al., 2008	Honduras	Olancho	14.949	−85.913	McCranie et al. 2011
UF156500	*16S* rRNA, *Cytb*	*O. kasios* McCranie et al., 2008	Honduras	Francisco Morazán	14.949	−87.056	Sunyer et al. 2010
MVZ:Herp:232825	*16S* rRNA, *Cytb*	*O. kasios* McCranie et al., 2008	Honduras	Olancho	15.117	−86.733	McCranie et al. 2008
MVZ:Herp:232826	*16S* rRNA, *Cytb*	*O. kasios* McCranie et al., 2008	Honduras	Olancho	15.117	−86.733	McCranie et al. 2008
SMF90079	*16S* rRNA, *Cytb*	*O. koehleri* Sunyer et al., 2011	Nicaragua	Matagalpa	—	—	Sunyer et al. 2011
UF156456	*16S* rRNA, *Cytb*	*O. koehleri* Sunyer et al., 2011	Nicaragua	North Caribbean Coast Autonomous Region	13.713	−85.031	Sunyer et al. 2011
MVZ:Herp:263988	*16S* rRNA, *Cytb*	*O. leptopoda* McCranie et al., 2008	Honduras	Cortés			Decena-Segarra et al. 2020
MVZ:Herp:167772	Cytb	*O. leptopoda* McCranie et al., 2008	Honduras	Yoró	15.267	−87.435	García-París and Wake 2000
MVZ:Herp:219997	*16S* rRNA, *Cytb*	*O. maritima* García-París & Wake, 2000	Panama	Bocas del Toro	9.098	−81.571	García-París and Wake 2000
CM158768	*16S* rRNA	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.238	−85.944	Hofmann et al. 2016
MHUL003	*16S* rRNA	*O. nica* Sunyer et al., 2010	Nicaragua	Matagalpa	13.032	−85.887	Sunyer et al. 2011
MVZ:Herp:263774	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.155	−85.871	Rovito et al. 2012
UF156445	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.575	−85.697	Sunyer et al. 2010
UF156446	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.576	−85.713	Sunyer et al. 2010
UF156447	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.576	−85.713	Sunyer et al. 2010
UF156451	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.581	−85.696	Sunyer et al. 2010
UF156452	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.581	−85.696	Sunyer et al. 2010
UF156453	*16S* rRNA, *Cytb*	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.281	−85.709	Sunyer et al. 2010
UF156454	*16S* rRNA	*O. nica* Sunyer et al., 2010	Nicaragua	Jinotega	13.281	−85.709	Sunyer et al. 2010
MVZ:Herp:190858	Cytb	*O. pacificensis* Taylor, 1952	Costa Rica	Puntarenas	8.515	−83.563	García-París and Wake 2000
MVZ:Herp:190859	Cytb	*O. pacificensis* Taylor, 1952	Costa Rica	Puntarenas	8.515	−83.563	García-París and Wake 2000
UCR12063	*16S* rRNA, *Cytb*	*O. pacificensis* Taylor, 1952	Costa Rica	Puntarenas	—	—	García-París and Wake 2000
UCRE7	Cytb	*O. pacificensis* Taylor, 1952	Costa Rica	Puntarenas	—	—	García-París and Wake 2000
IAvH-Am-6757	—	*O. parvipes* Peters, 1879	Colombia	Chocó	6.228	−77.413	Acosta-Galvis et al. 2020
MHUA-A 0456	—	*O. parvipes* Peters, 1879	Colombia	Antioquia	6.912	−75.078	GBIF 2023
MHUA-A 6473	—	*O. parvipes* Peters, 1879	Colombia	Antioquia	7.290	−75.399	GBIF 2023
MCZ:Herp:A-38770	—	*O. parvipes* Peters, 1879	Costa Rica	Puntarenas	9.267	−83.867	GBIF 2023
MCZ:Herp:A-10651	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10652	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10653	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10654	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10655	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10656	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10657	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10658	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-10659	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-11752	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-11753	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-11754	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.365	−79.959	GBIF 2023
MCZ:Herp:A-120829	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.383	−79.883	GBIF 2023
MCZ:Herp:A-120830	—	*O. parvipes* Peters, 1879	Panama	Zona del Canal de Panamá	9.383	−79.883	GBIF 2023
MCZ:Herp:A-15293	—	O. parvipes Peters, 1879	Panama	Panamá	9.155	−79.848	GBIF 2023
MCZ:Herp:A-15294	—	O. parvipes Peters, 1879	Panama	Panamá	9.155	−79.848	GBIF 2023
MCZ:Herp:A-19783	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-22311 †	—	O. parvipes Peters, 1879	Panama	Colón	9.567	−79.317	GBIF 2023
MCZ:Herp:A-9599	—	O. parvipes Peters, 1879	Panama	Canal Zone	9.149	−79.760	GBIF 2023
MCZ:Herp:A-9600	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.383	−79.883	GBIF 2023
MCZ:Herp:A-9601	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9602	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9603	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9604	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9605	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9606	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9607	—	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.367	−79.952	GBIF 2023
MCZ:Herp:A-9833 †	—	O. parvipes Peters, 1879	Panama	Panamá Oeste	8.467	−80.033	GBIF 2023
MCZ:Herp:A-9834 †	—	O. parvipes Peters, 1879	Panama	Panamá Oeste	8.467	−80.033	GBIF 2023
MCZ:Herp:A-9835 †	—	O. parvipes Peters, 1879	Panama	Panamá Oeste	8.467	−80.033	GBIF 2023
MCZ:Herp:A-9836 †	—	O. parvipes Peters, 1879	Panama	Panamá Oeste	8.467	−80.033	GBIF 2023
NHMUK ZOO 1914.5.21.90 ‡	—	O. parvipes Peters, 1879	Colombia	Chocó	5.094	−76.661	GBIF 2023
UMMZ:herps:58499	—	O. parvipes Peters, 1879	Panama	Chiriqui	8.431	−82.833	GBIF 2023
UMMZ:herps:63540	—	O. parvipes Peters, 1879	Panama	Canal zone	9.156	−79.845	GBIF 2023
UVC-14682	—	O. parvipes Peters, 1879	Colombia	Valle del Cauca	4.143	−77.425	GBIF 2023
COLZOOCH-H: 2164	—	O. parvipes Peters, 1879	Colombia	Chocó	5.705	−76.440	GBIF 2023
KU140298 ‡	—	O. parvipes Peters, 1879	Colombia	Antioquia	7.249	−76.426	GBIF 2023
KU66744	—	O. parvipes Peters, 1879	Costa Rica	Puntarenas	8.650	−83.150	GBIF 2023

Voucher	Genes	Species	Country	Province / department	Latitude	Longitude	Source
KU66748	—	O. parvipes Peters, 1879	Costa Rica	San Jose	9.278	−83.835	GBIF 2023
USNM 219120	—	O. parvipes Peters, 1879	Costa Rica	Puntarenas	8.700	−83.520	GBIF 2023
USNM 219121	—	O. parvipes Peters, 1879	Costa Rica	Puntarenas	8.700	−83.520	GBIF 2023
USNM 203594	—	O. parvipes Peters, 1879	Panama	Canal Zone	9.080	−79.600	GBIF 2023
AJC1786	*16S* rRNA	O. parvipes Peters, 1879	Panama	Panamá	9.228	−79.419	Crawford et al. 2010
MVZ:Herp:210404	*16S* rRNA, *Cytb*	O. parvipes Peters, 1879	Panama	Comarca Guna Yala	9.267	−78.967	García-París and Wake 2000
MVZ:Herp:210405	*16S* rRNA, *Cytb*	O. parvipes Peters, 1879	Panama	Zona del Canal de Panamá	9.147	−79.731	García-París and Wake 2000
MVZ:Herp:163703	*16S* rRNA, *Cytb*	*O. poelzi* Brame, 1963	Costa Rica	Alajuela	10.167	−84.150	García-París and Wake 2000
MVZ:Herp:194873	*16S* rRNA, *Cytb*	*O. poelzi* Brame, 1963	Costa Rica	Cartago	9.825	−83.413	García-París and Wake 2000
MVZ:Herp:206398	*16S* rRNA, *Cytb*	*O. poelzi* Brame, 1963	Costa Rica	Heredia	10.117	−84.100	García-París and Wake 2000
MVZ:Herp:207128	*16S* rRNA, *Cytb*	*O. poelzi* Brame, 1963	Costa Rica	Alajuela	10.333	−84.750	García-París and Wake 2000
MVZ:Herp:181235	Cytb	*O. poelzi* Brame, 1963	Costa Rica	San José §	10.409	−83.928	García-París and Wake 2000
MVZ:Herp:181348	Cytb	*O. poelzi* Brame, 1963	Costa Rica	Alajuela	10.200	−84.167	García-París and Wake 2000
MVZ:Herp:181229	Cytb	*O. pseudouniformis* Brame, 1968	Costa Rica	Cartago	9.850	−83.433	García-París and Wake 2000
MVZ:Herp:190852	Cytb	*O. pseudouniformis* Brame, 1968	Costa Rica	Cartago	9.900	−83.650	García-París and Wake 2000
MVZ:Herp:203749	*16S* rRNA, *Cytb*	*O. pseudouniformis* Brame, 1968	Costa Rica	Cartago	9.900	−83.650	García-París and Wake 2000
USNM565902	*16S* rRNA	*O. quadra* McCranie et al., 2008	Honduras	Olancho	15.380	−86.250	McCranie et al. 2011
USNM565904	*16S* rRNA	*O. quadra* McCranie et al., 2008	Honduras	Olancho	15.430	−85.900	McCranie et al. 2011
USNM565903	*16S* rRNA	*O. quadra* McCranie et al., 2008	Honduras	Olancho	15.300	−85.350	McCranie et al. 2011
USNM565900	*16S* rRNA	*O. quadra* McCranie et al., 2008	Honduras	Olancho	14.880	−85.900	McCranie et al. 2011
MVZ:Herp:232824	*16S* rRNA, *Cytb*	*O. quadra* McCranie et al., 2008	Honduras	Gracias a Dios	14.800	−84.767	McCranie et al. 2008
JES2438	Cytb	*O. salvadorensis* Rand, 1952	El Salvador	No data	—	—	Decena-Segarra et al. 2020
MVZ:Herp:229360	Cytb	*O. savagei* García-París & Wake, 2000	Costa Rica	Puntarenas	8.750	−82.983	García-París and Wake 2000
UCR-LDG-961327	*16S* rRNA, *Cytb*	*O. savagei* García-París & Wake, 2000	Costa Rica	Puntarenas	8.750	−82.983	García-París and Wake 2000
SMF78738	*16S* rRNA	O. sp	Nicaragua	No data	—	—	McCranie et al. 2008
MVZ:Herp:138918	Cytb	*O. stenopodia* Brodie & Campbell, 1993	Guatemala	San Marcos	14.933	−91.900	García-París and Wake 2000
MVZ:Herp:163649	*16S* rRNA, *Cytb*	*O. stenopodia* Brodie & Campbell, 1993	Guatemala	San Marcos	14.933	−91.900	García-París and Wake 2000
MVZ:Herp:267200	*16S* rRNA, *Cytb*	*O. taylori* Stuart, 1952	Honduras	Francisco Morazán	—	—	Rovito et al. 2015
USAC:1134	*16S* rRNA, *Cytb*	*O. taylori* Stuart, 1952	Guatemala	Zacapa	—	—	Sunyer et al. 2010
MVZ:Herp:258037	*16S* rRNA, *Cytb*	*O. tomasi* McCranie, 2006	Honduras	Cortés	15.855	−88.405	Rovito et al. 2015
UF 150066	*16S* rRNA, *Cytb*	*O. tomasi* McCranie, 2006	Honduras	Cortés	—	—	Sunyer et al. 2011
MVZ:Herp:190853	*16S* rRNA, *Cytb*	*O. uniformis* Keferstein, 1868	Costa Rica	Cartago	9.910	−83.725	García-París and Wake 2000
MVZ:Herp:203751	*16S* rRNA, *Cytb*	*O. uniformis* Keferstein, 1868	Costa Rica	Cartago	9.753	−83.804	García-París and Wake 2000
MVZ:Herp:181349	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	Alajuela	10.200	−84.167	García-París and Wake 2000
MVZ:Herp:194862	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	Cartago	9.983	−83.783	García-París and Wake 2000
MVZ:Herp:194864	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	Cartago	9.983	−83.783	García-París and Wake 2000
MVZ:Herp:194871	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	Cartago	9.950	−83.767	García-París and Wake 2000
MVZ:Herp:221321	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	San José	9.998	−83.964	García-París and Wake 2000
MVZ:Herp:221340	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	San José	9.886	−84.136	García-París and Wake 2000
MVZ:Herp:225905	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	San José	10.026	−84.000	García-París and Wake 2000
MVZ:Herp:225906	Cytb	*O. uniformis* Boulenger, 1897	Costa Rica	San José	9.998	−83.964	García-París and Wake 2000
FHGO 9642	—	O. aff. villamizariorum	Ecuador	Esmeraldas	0.867	−78.804	Reyes-Puig et al. 2020
QCAZA75501	*16S* rRNA, *Cytb*	*O. villamizariorum* Reyes-Puig et al., 2020	Ecuador	Carchí	1.025	−78.258	Reyes-Puig et al. 2020
ICN 61531	*16S* rRNA, *Cytb*	*O. villamizariorum* Reyes-Puig et al., 2020	Colombia	Cauca	2.965	−78.174	This study

* Coordinates were approximated according to the locality reported.
† Province recovered from geographical coordinates.
‡ The record is not georeferenced in the museum catalog; the coordinates are recovered from Acosta-Galvis et al. (2020).
§ The location information does not match with the coordinates.

Table A2. Uncorrected *p*-distances for the fragment of *16S* gene (533 bp) of the *Oedipina* species, expressed as percentages (means).

	N	ICN	all	ber	cap	car	col	com	cyc	elo	gep	grac	gran	ign	kas	koe	lep	mar	nic	pac	par	poe	pse	qua	sav	sp	ste	tay	tom	uni
ICN61531	1	—																												
alleni	4	6.20	1.77																											
berlini	1	5.93	7.04	—																										
capitalina	1	7.17	10.70	11.97	—																									
carablanca	1	5.73	6.74	7.52	7.69	—																								
collaris	1	8.90	8.81	9.79	6.22	9.19	—																							
complex	2	2.65	6.02	6.15	7.16	6.78	8.96	2.71																						
cyclocauda	2	7.31	7.35	9.27	4.05	8.46	7.19	7.40	0.21																					
elongata	2	6.62	7.09	7.55	6.37	4.94	8.39	7.40	7.97	0.21																				
gephyra	4	6.68	6.55	6.67	6.65	6.74	9.33	7.01	7.20	6.62	1.71																			
gracilis	1	7.84	7.61	8.96	4.36	8.98	5.21	7.81	5.31	8.50	8.19	—																		
grandis	1	8.05	7.56	8.75	4.36	7.93	4.38	8.65	6.15	7.56	8.29	5.21	—																	
ignea	1	7.86	7.52	9.19	1.66	7.11	6.68	8.04	4.91	6.94	6.85	5.43	4.59	—																
kasios	5	9.33	10.12	9.59	8.43	10.24	9.59	9.17	9.90	9.14	9.73	10.84	8.34	8.90	0.13															
koehleri	2	6.99	8.03	8.96	4.56	8.56	7.08	6.98	3.44	7.76	6.83	5.00	5.83	5.43	8.97	0.00														
leptopoda	1	5.07	4.82	6.12	3.17	5.23	6.35	5.33	2.61	5.71	4.88	4.31	4.31	4.31	7.49	2.72	—													
maritima	1	4.03	5.96	5.64	7.07	6.07	9.19	3.44	8.25	6.73	6.06	8.56	8.77	7.74	8.98	8.14	5.90	—												
nica	10	9.80	9.22	9.68	8.97	10.09	9.70	9.22	9.48	10.06	9.34	10.39	8.64	9.24	2.79	8.42	6.64	9.48	0.24											
pacifiensis	1	6.41	6.57	7.98	3.35	7.16	5.04	6.62	4.31	6.97	6.73	3.36	4.20	4.00	8.62	4.83	2.75	7.16	8.76	—										
parvipes	3	3.96	5.67	4.66	7.20	5.99	8.90	3.58	8.10	5.92	6.05	8.41	8.21	8.08	8.63	7.23	5.07	3.97	8.26	6.80	0.11									
poelzi	4	8.16	7.61	8.75	5.96	8.04	6.41	8.44	5.78	7.87	7.96	6.09	4.11	6.52	9.59	6.41	4.93	7.93	9.20	4.73	7.65	2.60								
pseudiformis	1	7.42	8.13	8.96	3.32	8.35	6.25	7.50	1.56	7.87	7.14	4.58	5.21	4.18	9.38	3.33	2.72	8.35	9.62	3.78	8.07	5.73	—							
quadra	5	8.90	9.02	9.38	7.47	8.77	10.21	8.44	8.44	9.02	9.28	9.79	8.96	8.14	4.59	7.50	5.90	8.35	4.70	8.19	7.86	9.22	8.13	0.08						
savagei	1	7.01	2.98	7.72	8.11	7.74	8.98	6.99	8.25	7.78	7.63	8.56	7.93	7.95	10.87	8.35	6.36	7.11	9.85	7.79	6.97	8.98	8.77	10.65	—					
sp.	1	7.07	7.01	8.63	3.77	7.38	5.05	7.05	3.89	6.98	6.85	3.58	4.42	4.01	9.48	4.42	2.97	7.81	9.21	1.69	7.45	4.89	3.37	8.63	8.02	—				
stenopodia	1	7.20	6.99	8.75	1.66	7.52	6.67	7.60	4.90	6.93	6.93	5.83	5.00	2.09	9.09	5.83	4.08	7.10	9.64	4.41	7.79	5.36	4.58	8.13	8.14	4.84	—			
taylori	2	7.94	8.11	9.27	3.53	8.77	5.21	8.23	5.94	8.29	8.08	5.42	3.33	3.76	8.53	6.04	4.20	8.56	9.00	3.99	8.52	5.73	5.00	8.44	8.66	4.84	3.54	0.83		
tomasi	2	7.02	6.70	7.53	6.56	6.60	9.10	7.53	6.90	6.42	4.37	8.68	8.05	7.44	9.42	7.01	5.35	7.44	9.02	6.43	6.91	7.69	7.01	8.79	7.97	6.66	7.22	8.37	0.00	
uniformis	2	7.20	7.25	8.54	3.42	7.52	5.52	7.40	3.96	7.14	6.73	3.44	4.48	3.76	8.86	4.48	3.17	7.93	9.24	1.05	7.58	4.84	3.23	8.65	8.14	1.47	4.48	4.48	6.80	0.83
villam.	1	0.64	6.43	6.47	7.48	5.44	8.56	3.03	7.62	6.52	7.00	8.14	7.72	7.53	9.40	7.31	5.45	4.39	9.88	6.32	4.32	8.19	7.72	9.19	7.11	6.96	7.10	7.62	7.34	7.20

Table A3. Uncorrected *p*-distances for the fragment of *Cytb* gene (385 bp) of the *Oedipina* species, expressed as percentages (means).

	N	ICN	all	ber	car	col	com	cyc	elo	gep	grac	gran	ign	kas	koe	lep	mar	nic	pac	par	poe	pse	qua	sal	sav	ste	tay	tom	uni	vil
ICN61531	1	—																												
alleni	3	14.13	5.84																											
berlini	1	9.68	12.29	—																										
carablanca	1	16.59	16.13	20.74	—																									
collaris	1	19.35	16.90	18.89	16.59	—																								
complex	2	6.45	14.21	9.91	16.82	17.05	8.29																							
cyclocauda	2	15.67	17.36	18.89	17.97	13.13	14.06	0.46																						
elongata	2	14.75	15.21	17.05	14.29	12.90	15.21	18.89	0.92																					
gephyra	4	14.98	14.55	16.01	14.17	16.82	15.21	18.55	14.40	3.00																				
gracilis	1	18.43	14.75	17.97	18.89	15.21	17.97	14.06	16.59	15.67	—																			
grandis	2	19.35	15.98	18.89	17.51	9.22	17.51	12.21	16.59	17.63	16.13	0.00																		
ignea	1	17.05	14.75	16.59	16.59	11.06	17.74	14.52	13.82	15.78	15.21	7.83	—																	
kasios	3	15.23	16.77	19.85	15.69	17.54	15.00	14.54	17.08	14.54	16.15	17.54	16.62	0.00																
koehleri	2	13.19	15.82	17.36	17.82	11.80	13.31	5.79	15.97	18.87	12.73	10.42	11.80	13.21	0.47															
leptopoda	2	18.66	16.05	17.74	17.97	12.90	17.28	14.29	13.59	16.36	12.44	9.22	9.22	16.15	12.73	0.92														
maritima	1	9.68	14.44	13.36	16.13	17.97	9.68	15.67	13.82	14.75	17.51	17.97	17.51	15.69	15.05	19.59	—													
nica	7	17.34	15.35	19.13	17.15	16.14	17.07	15.83	18.81	16.33	18.34	17.07	16.61	5.81	14.56	17.34	18.67	0.45												
pacifiensis	4	17.28	16.55	19.93	18.32	11.98	16.24	10.48	15.32	18.26	11.52	13.82	11.64	14.19	9.95	13.13	16.13	15.57	2.76											
parvipes	2	6.45	13.29	10.14	15.44	17.51	7.83	17.05	14.06	13.59	17.74	17.97	17.05	13.85	14.12	18.43	8.29	16.98	18.09	4.15										
poelzi	6	17.05	16.62	18.97	17.36	9.60	16.59	9.91	14.06	15.78	13.82	9.14	9.68	14.00	9.57	8.99	18.36	16.48	9.75	18.05	4.09									
pseudiformis	3	14.75	16.74	18.89	16.59	13.82	14.98	5.30	18.89	16.47	12.44	11.52	11.98	13.85	5.56	12.90	16.13	16.14	10.37	15.44	10.75	0.00								
quadra	1	14.75	17.20	20.28	18.89	17.97	17.28	16.36	16.13	17.28	19.35	18.89	17.51	10.15	16.20	17.97	17.51	11.41	16.13	14.29	16.82	13.82	—							
salvadorensis	1	14.75	17.20	17.05	18.43	15.21	15.21	12.67	16.59	16.01	17.05	16.59	13.36	15.69	15.05	15.21	18.43	13.95	12.21	16.59	13.59	15.21	17.51	—						
savagei	2	11.06	9.06	13.82	12.90	16.13	13.59	15.67	11.98	13.59	17.51	15.21	13.36	17.54	15.05	14.98	13.36	18.49	15.09	13.59	14.29	15.67	16.59	16.13	0.92					
stenopodia	2	16.36	14.75	18.66	15.90	14.06	17.28	12.44	14.98	16.71	12.67	11.52	7.14	14.54	12.04	11.75	17.28	15.58	10.71	16.13	9.68	11.75	14.98	11.29	14.06	0.46				
taylori	2	14.98	16.05	16.82	18.20	14.75	15.21	13.36	16.36	16.24	18.43	16.36	13.82	17.08	15.05	16.36	17.74	14.88	13.59	16.13	13.90	15.67	18.43	2.30	15.90	11.75	2.76			
tomasi	2	16.13	16.44	15.21	19.35	16.59	16.13	17.74	16.59	11.18	17.51	16.59	15.67	14.77	17.82	17.05	15.21	16.87	17.17	14.52	15.44	17.05	19.82	14.29	18.43	16.82	13.82	0.00		
uniformis	10	18.06	15.64	20.00	18.25	11.24	16.68	12.67	14.79	18.85	10.97	13.55	11.43	14.95	10.14	14.19	17.05	15.52	3.78	18.34	10.41	11.98	16.68	13.55	15.35	10.37	14.06	18.48	2.33	
villam.	1	2.86	13.65	9.52	16.67	18.10	7.14	15.71	12.86	14.40	17.62	18.57	16.67	16.22	14.11	17.86	9.05	18.35	16.43	8.10	16.67	15.24	15.71	14.76	10.48	16.43	15.00	16.67	17.29	—